ENVIRONMENTAL PLANNING

US Army Corps of Engineers

COST EFFECTIVENESS (CE) AND INCREMENTAL COST ANALYSES (ICA)

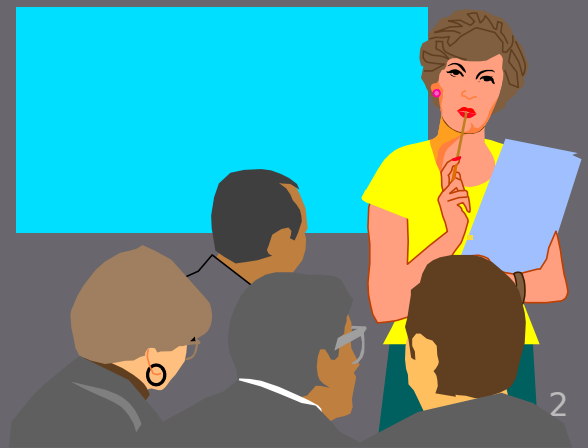
"IWR-Planning Suite"
http://www.iwr.usace.army.mil

Ch 6 Mod 5
See ICA Tutorial in Reference Folder

Learning Objectives

- **Students will be able to identify conditions under which CE/ICA is required under current Corps guidance**

- **Students will be able to identify the data required to conduct an effective CE/ICA**



Which Scares YOU More??

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Cost Effectiveness and Incremental Cost Analyses ….

References

- **ER 1105-2-100**
  - Chapter 2, Planning Principles
  - Chapter 3, Corps Civil Works Missions
  - Appendix E, Civil Works Missions & Evaluation Procedures
- **IWR Report 95-R-1**
  - "Procedures Manual: Cost Effectiveness and Incremental Cost Analyses"
- **IWR Report 94-PS-2**
  - "Cost Effectiveness Analysis for Environmental Planning: Nine EASY Steps"
- **IWR Report 02-R-5**
  - "Lessons Learned from Cost Effectiveness & Incremental Cost Analyses"

Planning Guidance ER 1105-2-100
(22 April 2000)

- ***Requires CE/IC analyses for all mitigation and ecosystem restoration projects***

- **"Selecting the NER plan requires careful consideration of the plan that meets planning objectives and constraints and reasonably maximizes environmental benefits while passing tests of CE/ICA, significance of outputs, acceptability, completeness, efficiency, and effectiveness." (Appendix E, E-41)**

- **CE/ICA helps support selection of mitigation plans**

What are CE/ICA?

Tools to inform and support environmental investment decision-making

WHY USE CE/ICA?

To make more informed decisions…
document economic efficiency,
make sound financial investments

CE/IC Analyses are NOT….

- A substitute for the planning process
- A measurement technique
- Methods to provide a single “right” answer
- Basis for a Benefit Cost Ratio (BCR) - (Flood Control Act 1936)

Plan Comparison: Costs & Outputs

Alternative Restoration Plans	Plan Outputs	Plan Costs
No Action Plan	0 Habitat Units	$0
Green Plan	950 Habitat Units	$500,000
Blue Plan	950 Habitat Units	$ 750,000
Red Plan	1,000 Habitat Units	$ 1,000,000

Results of Cost Effectiveness Analysis

Alternative Restoration Plans	Plan Outputs	Plan Costs
No Action Plan	0 Habitat Units	$0
Green Plan	950 Habitat Units	$500,000
Red Plan	1,000 Habitat Units	$ 1,000,000

Results of Incremental Cost Analysis

Alter-natives Plans	Plan Costs	Plan Outputs	Incre-mental Cost	Incre-mental Output	Incre-mental Cost/ Unit Output
No Action Plan	$0	0 HU's	$0	0 HU's	$0
Green Plan	$500,000	950 HU's	$500,000	950 HU's	$526
Red Plan	$1,000,000	1000 HU's	$500,000	50 HU's	$10,000

Who does CE/ICA?

Interdisciplinary Team

- Plan formulator
- Biologist
- Economist
- Cost estimator
- H & H specialist
- Real estate special
- Decision maker
- Other disciplines
- Other stakeholders!

Why is CE/ICA important to You? (Biologists and PMs)

- **Understanding of CE/ICA concepts is needed for:**
  - **Formulation of environmental alternatives**
  - **Development of environmental outputs**
  - **Mitigation**
  - **Conducting CE/ICA and using IWR-Planning Suite**
  - **Managing/monitoring contractors use of CE/ICA and IWR-Planning Suite**
  - **Reviewing CE/ICA results**

Applicability

- Restoration and mitigation
- All scopes of problems
- All scales of projects
- All phases of work
- All types of resources
- Many agencies and interests

How do you do CE/ICA?

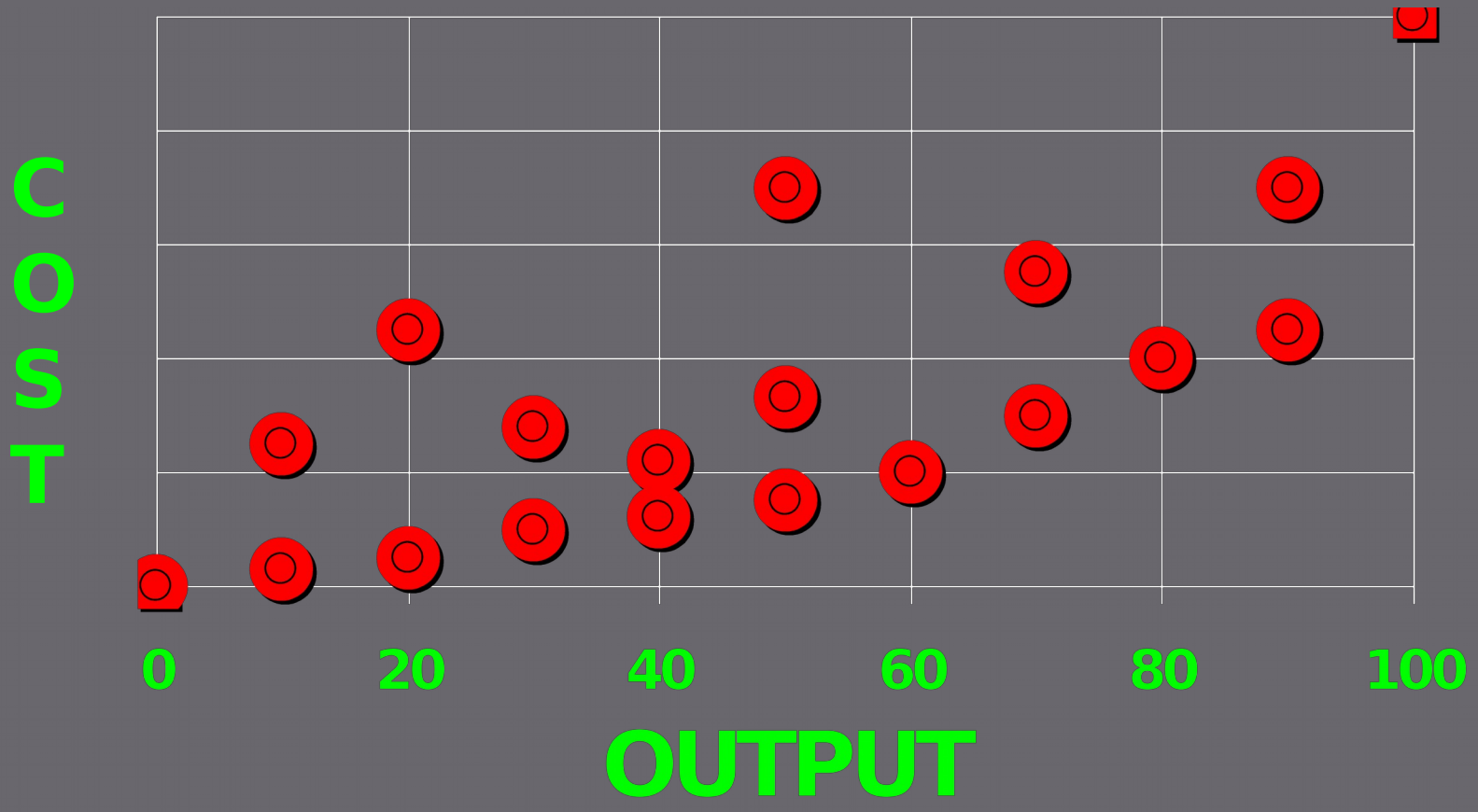
- **To start, you need:**
  - **Solutions** that address project objective(s)
    - Independent
    - Implementable
    - Different scales
  - **Costs** should be comparable (same level of detail) among alternatives
  - **Outputs**
    - Quantifiable and cost-related
    - Quality as related to significance
- **Proper Preparation Essential**

Solutions Can Consist Of:

- **Management measures**
  - **Dredging, substrate improvement, planting, removal of exotics, aerating, fencing, land management, water control structures, etc.**

- **Alternative plans**
  - **Fully-formulated alternatives**
  - **Different sites**
  - **Independent in nature**

Solutions Incur Costs and Produce Outputs



Environmental Costs and Outputs

- Quantify cost for each measure
  - Measures are independent building blocks for each alternative
- These costs are in dollars

- No universal environmental output metric
- OUTPUTS increase ecosystem value; productivity, quantity & *quality*

Measurements of Environmental Outputs Can Include:

- Habitat units (HU's and AAHU's)
- Physical dimensions (acres, LF of riverine habitat)
- Must include qualit
  dimension

Measurements of Environmental Outputs Can Include (Cont.):

- Population counts (# of birds, Kg of fish, # of adult salmon)
- Change in diversity (such as IBI)
- Resource quality must be considered as an indication of significance of resource

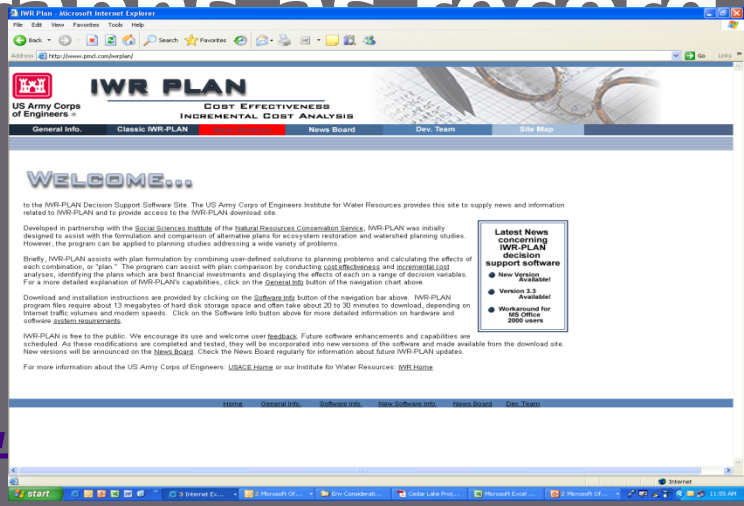
Significance of Environmental Outputs

- Qualitative info critical to determining “worth” of outputs
- Who or what says the resource is significant?
  - ***Institutional***
  - ***Public***
  - ***Technical***
- Important info in “telling your story”

Implementation: IWR-Planning Suite

- Software version of CE/ICA procedures
- Automates tedious math
  - Allows you to do more complicated analyses
    - Creates tables & graphs as record of analyses
    - Website: ***www.iwr.usace.army.***

Click on "products," then "software."



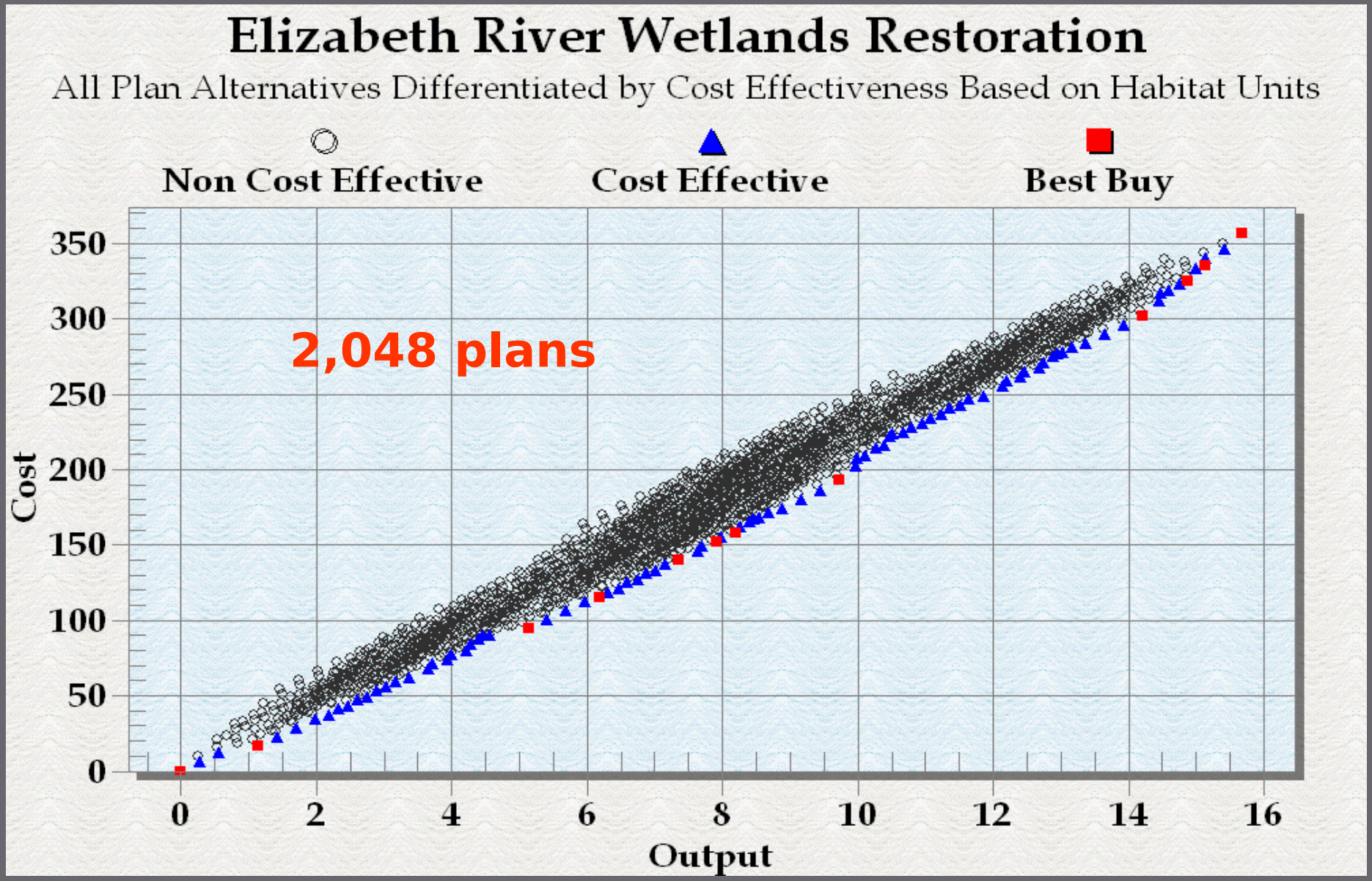
Step-by-step Process:

1. **Formulate plan alternatives**
   - **Develop outputs**
   - **Develop costs**
2. **Perform cost effectiveness analysis**
3. **Perform incremental cost analysis**
4. **Use results for decision-making & justification of recommended plan**

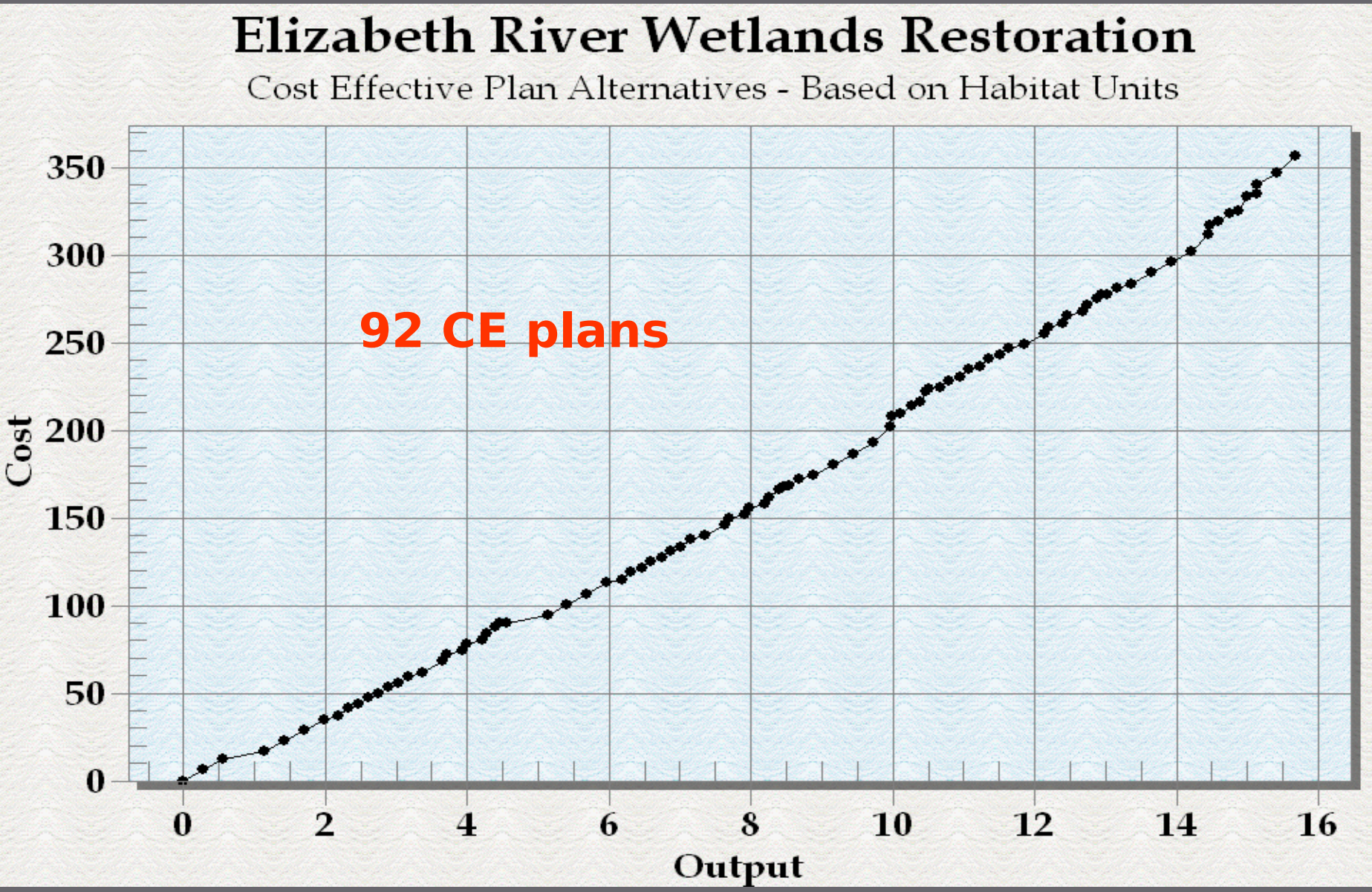
Cost Effective Plans:

- No other plan produces ***same*** level of output for less cost.
- No other plan produces ***more*** output for same or less cost.
- Unique regarding least cost per level of output.

Formulate All Plan Combinations



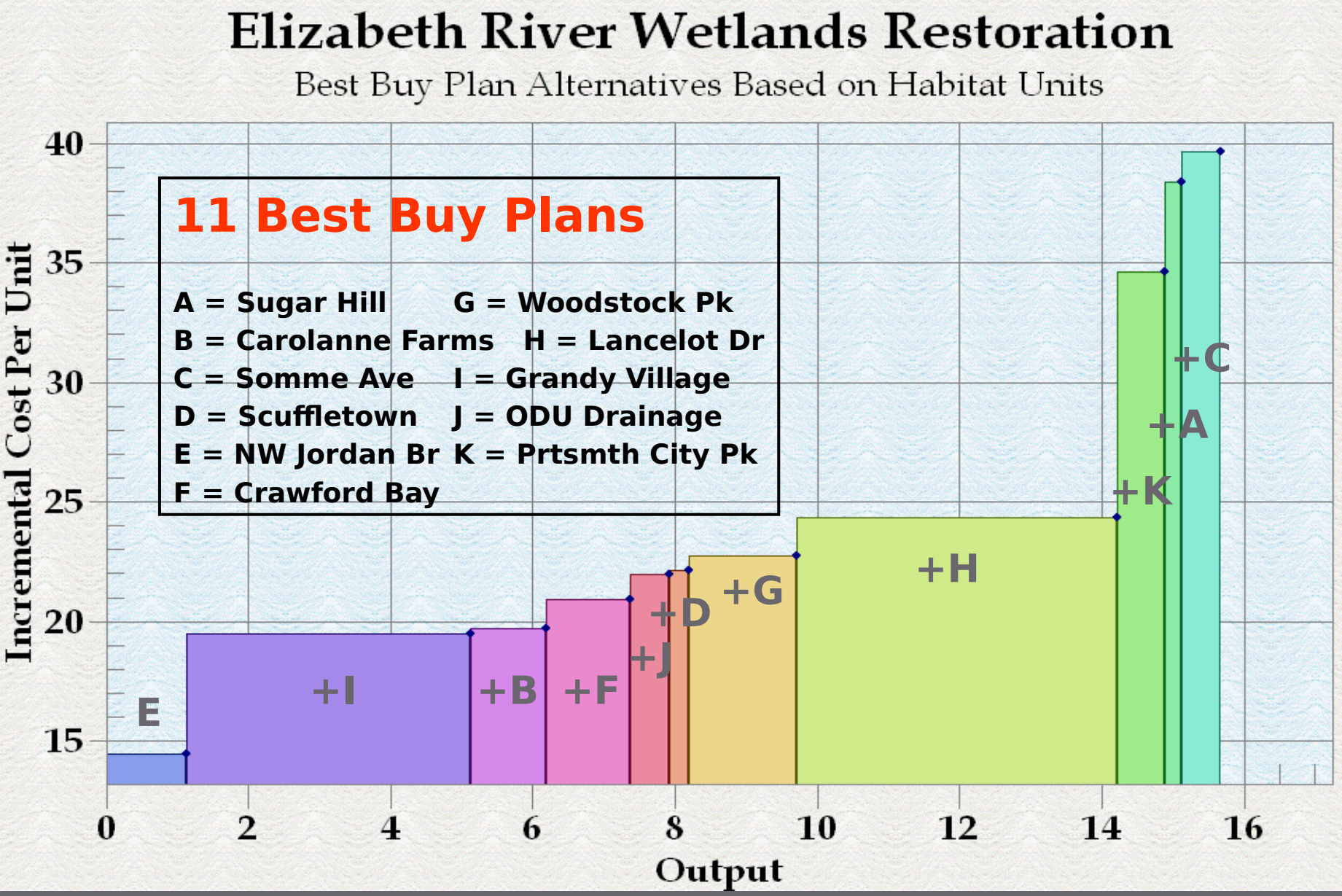
Cost Effectiveness Analysis



Best Buy Plans:

- Lowest incremental cost per unit of output
- Form a subset of cost effective plans
  - Most efficient in production at given levels of output
  - Greatest increases in output for least increase in cost
  - Incrementally the most cost effective plan at a given level of output

Incremental Cost Analysis

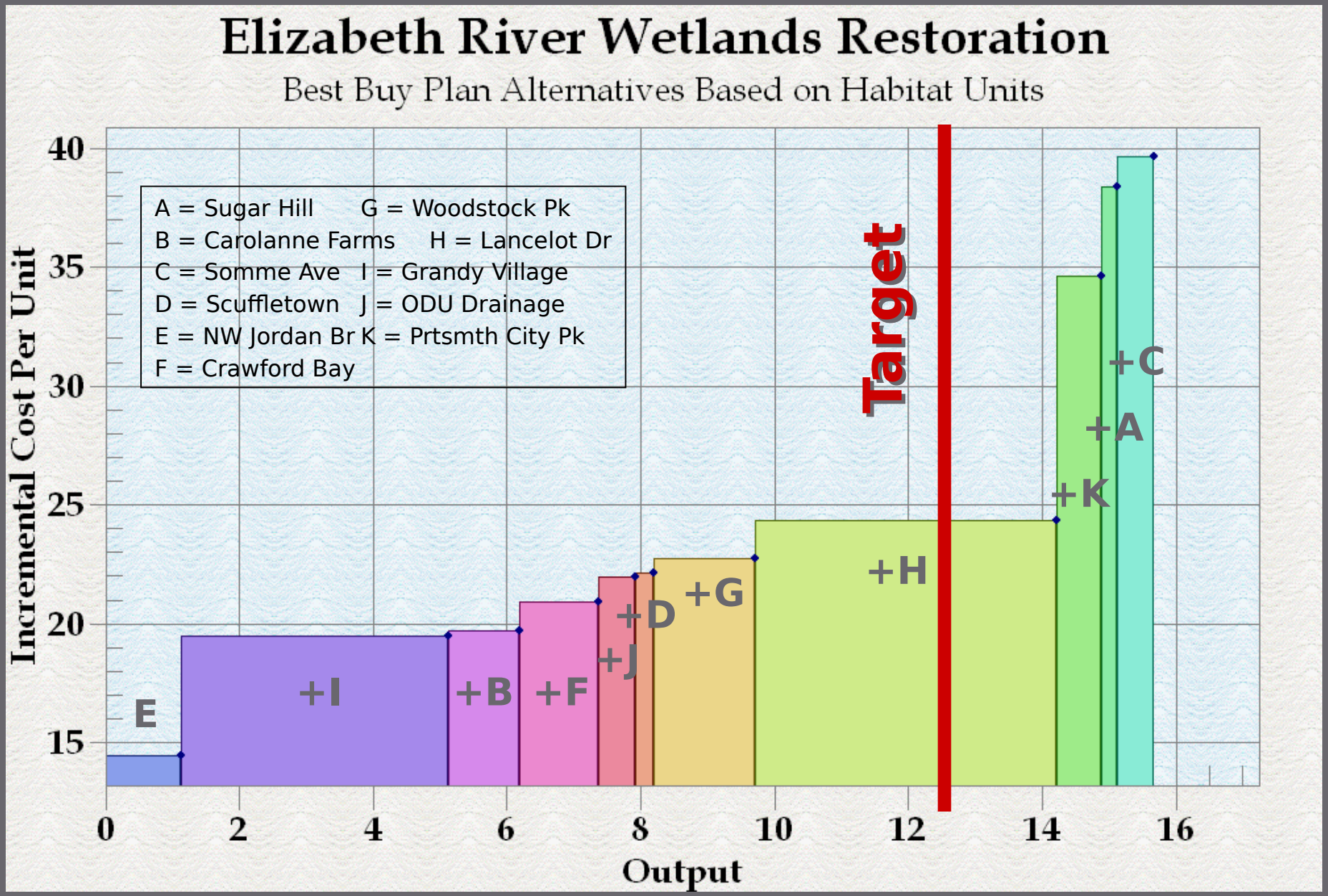


Is the alternative worth it?

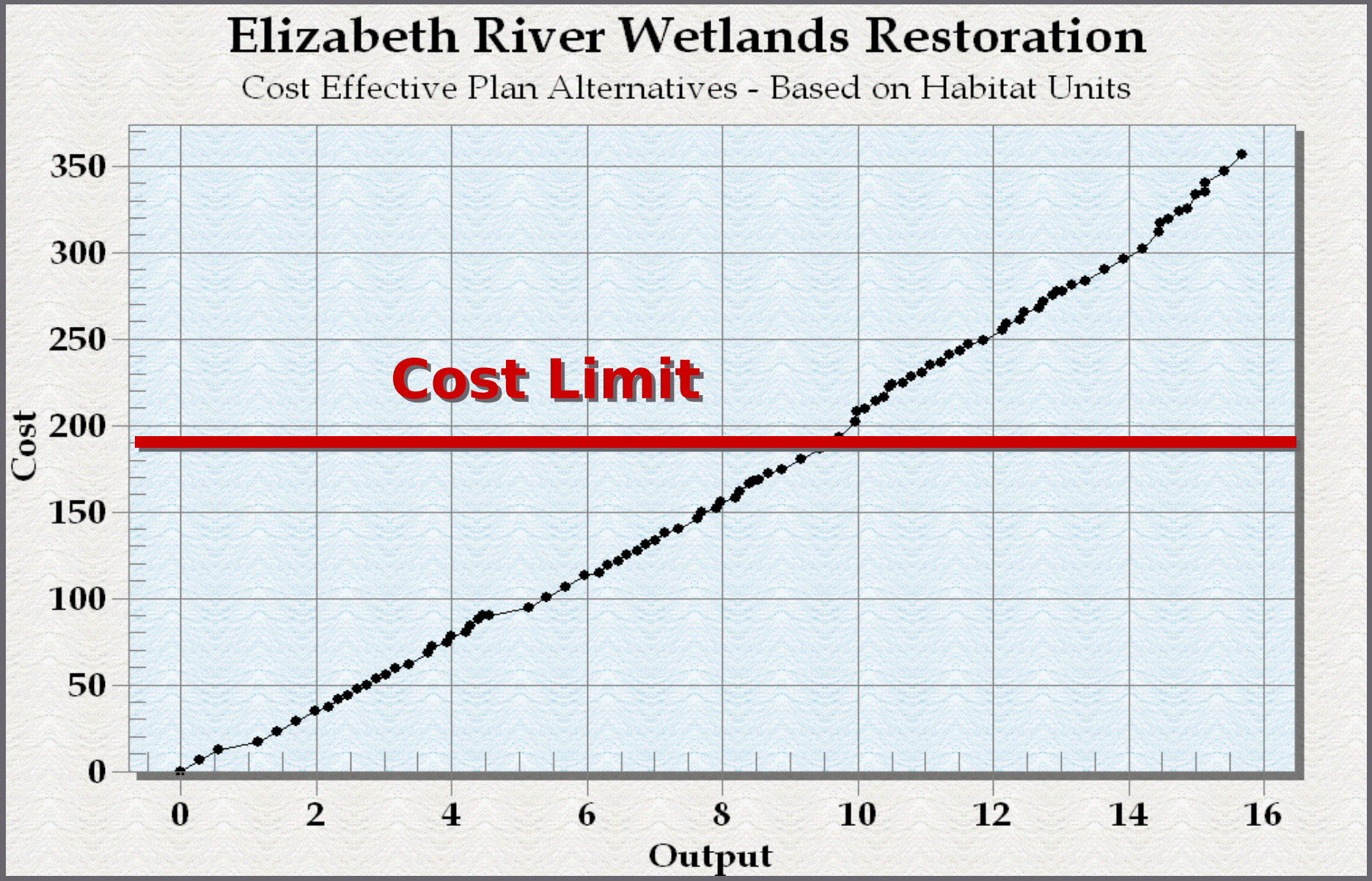
Decision making guidelines:

- **Output target.**
- **Output thresholds.**
- **Cost limit.**
- **Breakpoints.**
- **Does it make sense? Remember there is no BC consideration !**

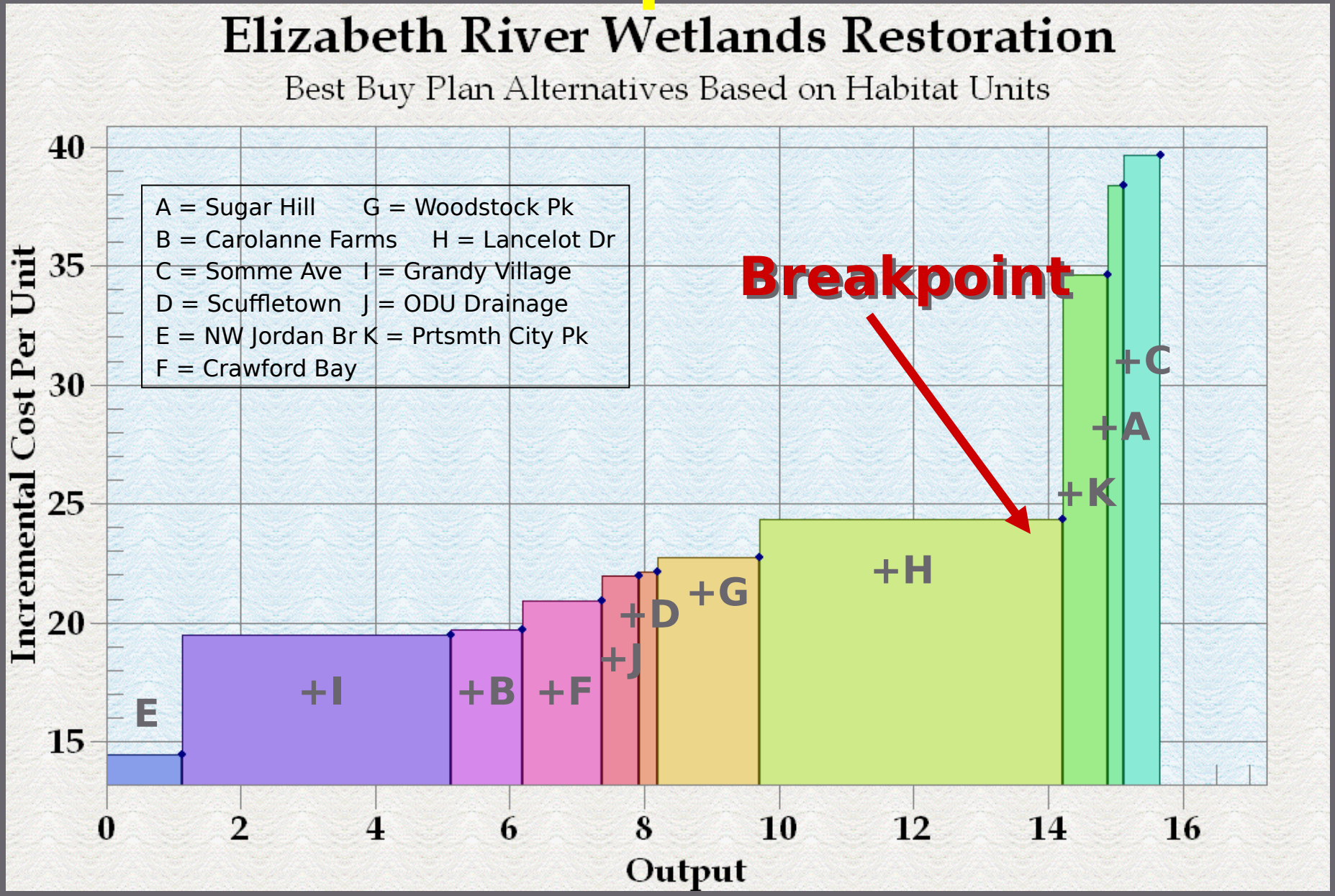
Output Target



Total Cost Limit



Breakpoints



Additional Decision Considerations!

- **Significance***
  - **Region of concern, priority urban area, exceptional resource area, et**
  - ***don't forget institutional, technical and public significance consideration!**
- **Scarcity**
  - **Historic habitat loss, few "available" sites, low diversity, threatened and endangered species, etc.**
- **Acceptability**
  - **Watershed Action Team, Coastal America, etc.**
- **Effectiveness**
  - **Addresses multiple problems, large geographic area, interconnected to natural system, creates habitat corridors, etc.**
- **Efficiency**
  - **Passes tests of CE/ICA**

Common Pitfalls

- Project goals should not be too limiting.
- Selection of the plan with the lowest cost or greatest output must be supported by environmental criteria.
- Plans which do not support the project goals should not be carried through the analyses.
- The formulation of plans should ensure that more than one plan meets the goal (or mitigation target).

Take Away Points

- CE/ICA are required for all ecosystem restoration and mitigation projects
- Environmental outputs must be significant and linked to resource quality
- CE/ICA do not “pick” the selected plan, they simply aid in decision